

The black flies from Huangshan Mountain, Anhui Province, China with the description of a new species of *Simulium (Simulium)* (Diptera: Simuliidae)

Ru CAI¹®, Yaya CHU¹, Jiyao AN², Lingling WANG¹

1. Department of Microbiology and Parasitology, Medical School, Anhui University of Science and Technology, Huainan, Anhui 232001, China

2. Department of Vector Biology and Control, State Key Laboratory of Pathogen and Biosecurity, Institute of Microbiology and Epidemiology, Beijing 100071, China

Abstract: A new species, *Simulium (Simulium) huangshanense* sp. nov., is described based on the adult, pupal and mature larval stages collected from Huang Mountain in Anhui Province, China. This species is assigned to the *griseifrons*-group of the subgenus *Simulium*, and is morphologically most similar to *S. (S.) grossifilum* Takaoka & Davies, 1995 from West Malaysia and *S. (S.) hengshanense* Bi & Chen, 2004 from Hunan Province in China. However it is clearly differentiated from them by the shapes of the anterior gonapophyses and cocoon.

Key words: *Simulium (Simulium) huangshanense*; black flies; taxonomy

安徽省黄山蚋属一新种记述（双翅目：蚋科）

蔡茹¹®, 储雅雅¹, 安继尧², 王玲玲¹

1.安徽理工大学医学院病原生物学教研室,安徽 淮南 232001; 2. 军事医学科学院微生物和流行病研究所, 病原微生物生物安全国家重点实验室, 北京 100071

摘要: 记述采自安徽省黄山蚋属 *Simulium* 賴亚属 *Simulium* 灰额蚋组 *griseifrons*-group 1 新种, 以产地命名为黄山蚋 *Simulium (Simulium) huangshanense* sp. nov., 对其雌、雄成虫、蛹及成熟幼虫的特征进行了描述。该新种与 *S. (S.) grossifilum* Takaoka & Davies, 1995 (来自马来西亚), *S. (S.) hengshanense* Bi & Chen, 2004 (来自中国湖南省) 形态相似, 但新种的生殖板和茧与上述蚋种明显不同。

关键词: 黄山蚋; 黑蝇; 分类

Introduction

The black flies (family Simuliidae) of Anhui Province, China have been very poorly studied. Sun & Cui (1996) recorded only two species, *Simulium (Nevermannia) aureohirtum* Brunetti, 1911 and *Simulium (Simulium) bidentatum* Shiraki, 1935 from Xiao County, Anhui Province. In this paper, five species of black flies were collected from Huangshan Mountain in Anhui Province of China. This includes four newly recorded species, *Simulium (Simulium) sakishimaense* Takanoka, 1977, *Simulium (Simulium) quinquestriatum* Shiraki, 1935,

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① Corresponding author, E-mail: lxhcrlh@aliyun.com

Simulium (Simulium) rufibasis Brunetti, 1911 and *Simulium (Simulium) bidentatum* Shiraki, 1935. A new species, *Simulium (Simulium) huangshanense* sp. nov., is reported with a morphological description and taxonomic discussion.

Material and methods

This study is based on the adult, pupal and mature larva stages collected from Huangshan Mountain in Anhui Province, China. The adult specimens were cleared in 5% KOH for 18 h at 26°C, dissected and mounted in Canada balsam on a microscope slide. The pinned specimens were examined under simulated natural light with a Nikon SMZ 800 stereomicroscope and genitalia were studied and illustrated with a Nikon E400 compound microscope.

Taxonomy

Simulium (Simulium) huangshanense sp. nov. (Figs. 1–16)

Female.

Medium-sized blackflies. Body length about 3.5 mm. Wing length about 3 mm.

Head. Slightly narrower than width of thorax. Frons and clypeus brownish black, whitish grey pruinose, covered with black pubescence hairs along lateral margins; Frontal ratio 45 : 36 : 40. Frons-head ratio 45 : 150. Antenna composed of 2+9 segments, brown black except scape and pedicel brownish yellow. Maxillary palp composed of 5 segments, proportional lengths of 1–5 segments 20 : 15 : 30 : 30 : 55; sensory vesicle of moderate size, elliptical, about 0.32 times as long as 3rd segment (Fig. 9). Maxilla with 11 inner and 13 outer teeth. Mandible with 42 inner and 35 outer teeth. Cibarium armed smooth (Fig. 2).

Thorax. Scutum brownish black, shiny, covered densely with recumbent whitish pubescence, interspersed with long, erect dark hairs on prescutellar area, when illuminated in front and viewed dorsally scutum with 5 longitudinal black vittae, 1 very fine medial vitta not reaching anterior border, 2 rather broad submedial vittae, 3 vittae united with broad transverse band on prescutellar region and 2 broad lateral ones, 2 vittae united with broad transverse band on prescutellar region. Scutellum brownish black, whitish pruinose, with recumbent yellow pruinose and long dark hairs. Postscutellum brownish black, whitish pruinose, without hairs. Pleural membrane and katepisternum bare.

Legs. All coxae brownish yellow except mid and hind coxae brownish black. All trochanters brownish yellow. All femora brownish yellow except hind femur on distal 5/6 brownish black. Fore tibia basal 3/4 brownish yellow, remaining part brownish black; median tibia brownish yellow; hind tibia basal 3/4 brownish yellow, remaining part brownish black; fore tarsus brownish black, mid basitarsus basal 3/4 and 2nd tarsomere basal 1/3 brownish yellow, remaining part brownish black; hind basitarsus on basal 2/3 and 2nd tarsomere on basal 1/2 brownish yellow, remaining part brownish black. Calcipala developed, about 0.5 times as long as width of basitarsal tip and reach the pedisulcus; pedisulcus distinct for about basal 1/3 of 2nd tarsal segment (Fig. 3). Claws simple (Fig. 11).

Wing. Costa with spinules as well as hairs. Subcosta with 23 root hairs on basal 1/3. Basal portion of radius with hair; hair tuft on stem vein blackish.

Abdomen. Basal scale black with fringe of brownish black hairs. Dorsal surface of abdomen brownish black, 2nd segment with a pair of large, dorsolateral whitish spots. 5–7 large, black, shining, with whitish hairs. Genitalia (Fig. 1). Sternite 8 well sclerotized, bare medially, with 21 thick hairs on each side. Anterior gonapophyses thin, membranous, mamma shaped in ventrolateral view, covered with microsetae and 14 short setae; side border narrowly sclerotized, widely separated from each other side, bearing transparent, narrow, long projection on inner posterior border end. Genital fork of inverted-Y form, with well sclerotized stem and arms; arm with stout outer projection of distal section on each arm (Fig. 1). Paraproct in ventral view, horizontally wide, hat shaped, with moderately setose and numerous microsetae (Fig. 4). Cercus in lateral view rectangular shaped, with many moderately setose and numerous microsetae (Fig. 4). Spermatheca similarly rounded, strongly sclerotized, but lacking internal hairs (Fig. 1).

Male.

Body length about 3.2 mm. Wing length about 2.6 mm.

Head. Slightly wider than the thorax. Upper eye consisting of large facets in 14 vertical columns and 12 horizontal rows. Clypeus black, whitish grey pruinose, with scattered dark stout hairs. Antenna with 2+9 segments, brownish black except scape, and pedicel, brownish yellow, close covered with brownish yellow hairs, 1st flagellomere elongated, 1.5 times as long as 2nd. Maxillary palp black, with five segments: proportional lengths of five segments are 12 : 13 : 20 : 26 : 42; and sensory vesicle (Fig. 8) elliptical, about 0.2 times as long as 3rd segment.

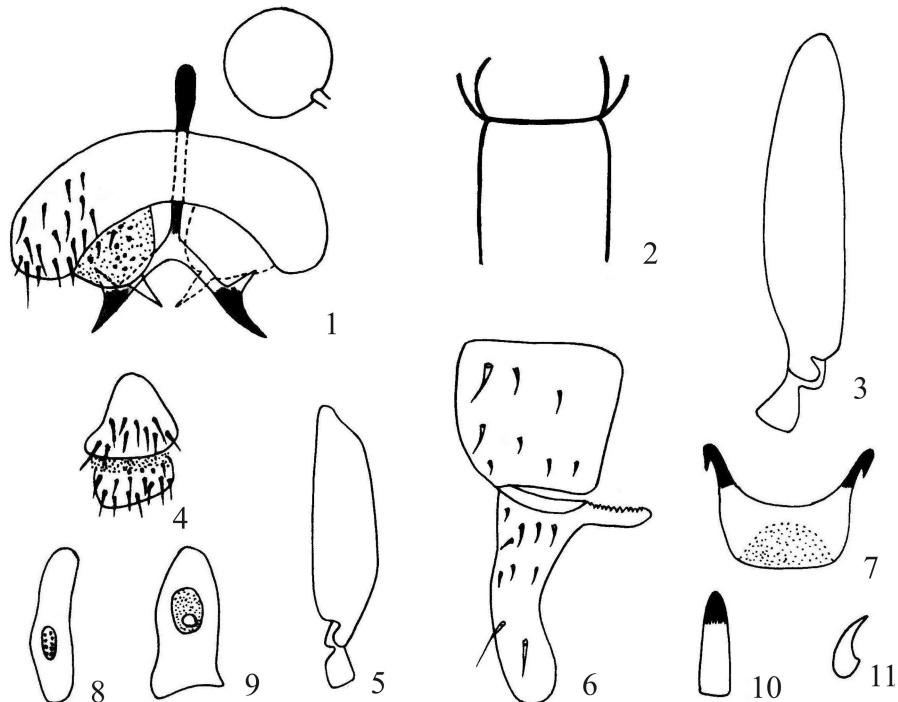
Thorax. Scutum brownish black, shiny, covered densely with recumbent, white pubescence, interspersed with long, erect dark hairs. When illuminated in front and viewed dorsally, scutum composed of anterior pair of large whitish scales, round spots with rounded apex on shoulders extending posteriorly along lateral margins up to wing and 2 vittae united with broad transverse band on prescutellar region. Scutellum, brownish black, with long brownish yellow hairs; postscutellum brownish black and bare. Pleural membrane and katepisternum bare.

Legs. Coxae, brownish black except fore coxa brownish yellow; trochanters, brownish yellow; femora, brownish yellow except hind femur on last 1/3 brownish black; tibiae, brownish black except fore tibia on medial portion, mid tibia and hind tibia on basal 1/5 and inside median portion brownish yellow; tarsi, brownish black except mid basitarsus on basal 4/5, hind basitarsus on basal 2/3 and 2nd tarsus on basal 1/3 brownish yellow; fore basitarsus, cylindrical, 6 : 4 as long as its greatest width; and hind basitarsus, enlarged, wedge-shaped. Calcipala is well developed, reaching the pedisulcus. Pedisulcus is distinct at basal 1/3 of 2nd tarsal segment (Fig. 5).

Wing. Costa with spinules as well as hairs; subcosta, hairy on basal 2/3; and basal portion of radius bare.

Abdomen. Basal scale black with fringe of whitish grey hairs, dorsal surface of abdomen brownish black, tergites 5–7 large, black, shining, with whitish grey hairs. Genitalia. Coxite in ventral view is about square, 0.9 times as long as wide (Fig. 6); style about 1.4 times as long as coxite (Fig. 6), tapered towards apical tip, gently curved inwards. Style with basal protuberance produced dorsally, bearing numerous spinules on its surface (Fig. 6). Ventral plate (Fig. 7) in ventral view, plate body short, 0.5 times as long as width, distinctly circular on

both sides and below, covered with microsetae almost entirely on ventral, posterior and dorsal surfaces; and basal arms slanting, extended with spiny hook on distal end. Paramere each with 18–20 distinct hooks. Median sclerite well sclerotised, forming a stick with its apical tip slightly cylindrical (Fig. 10).



Figures 1–11. *Simulium (Simulium) huangshanense* sp. nov. 1. Female genitalia, ventral view; 2. Female cibarium; 3. Hind basitarsus and 2nd tarsal segment of female; 4. Paraproct and cercus of female, lateral view; 5. Hind basitarsus and 2nd tarsal segment of male; 6. Coxite and style of male, ventral view; 7. Ventral plate, ventral view; 8. Male sensory vesicle; 9. Female sensory vesicle; 10. Median sclerite; 11. Female claw.

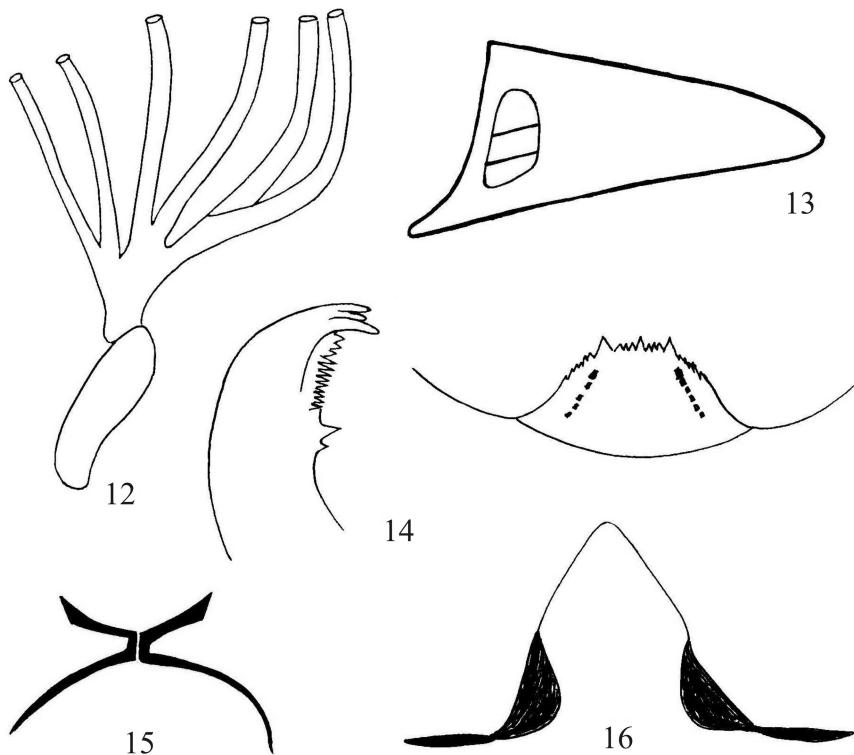
Pupa.

Body length about 3.5 mm. Gill filament length about 2.3 mm.

Head and thorax. Integument brownish yellow, densely covered with tubercles, with 1 facial and 2 frontal pairs of long, slender, simple trichomes. Thorax. Integument yellowish brown, densely covered with tubercles, with 4 dorsal pairs of rather long branched trichomes and 3 lateral pairs of rather long simple trichomes, those trichomes subequal in length to each other, but much longer than facial ones. Gill with 6 thick filaments, arranged in groups of 2+2+2, with short stalks (Fig. 12).

Abdomen. Tergum 1 with 3 thin, small setae on each side. Tergum 2 with 3 thin, long setae on each side. Terga 3 and 4 with 4 hooked spines along posterior margin per side. Terga 6 and 7 each with two hooked spines along posterior margin on each side. Tergum 8 with 2 thin, long setae on each side. Tergum 9 each with a transverse row of spiny-scales on each side.

Cocoon. Simple, wall pocket-shaped, moderately woven, extending ventrolaterally, anterior margin somewhat thick, with antero-lateral window on either side, anterior border thickened into a moderately strong rim (Fig. 13).



Figures 12–16. *Simulium (Simulium) huangshanense* sp. nov. 12. Filaments; 13. Cocoon, lateral view; 14. Larval cephalic apotome; 15. Larval anal sclerite; 16. Larval head capsules, ventral view.

Mature larva.

Body length 4.5–5.5 mm. Body color yellowish brown. Cephalic apotome pale brownish, with two stripes on both sides and one stripe on middle part head spots (Fig. 14). Antenna composed of three segments and apical sensillum longer than the stem of labral fan; lengths of the four segments, from base to tip, are in the ratio of 45 : 13 : 16 : 2; and labral fan with 38 main rays. Mandible comb teeth decreasing in size from 1st to 3rd teeth; and mandibular serrations composed of large and small teeth, without supernumerary serrations. Hypostomium (Fig. 16) with a row of 9 apical teeth, median tooth as long as corner tooth on each side, longer than three intermediate teeth on each side; lateral margin, moderately serrate apically; and hypostomal setae, 6 in number lying subparallel to lateral margins on each side. Postgenal cleft (Fig. 16), lanceolate shaped, moderately developed, 3.6 times as long as postgenal bridge. Thoracic and abdominal cuticle, bare. Larval abdomen with transverse, brownish yellow band on each segment. Rectal papilla compound, each of three lobes with four to five finger-like secondary lobules. Anal sclerite of usual x form, with anterior arms slightly shorter than the posterior ones, and broadly sclerotised at base (Fig. 15). Ventral papillae absent. Posterior

circlet with 86 rows of up to 9–12 hooklets per row.

Holotype. ♀, **China**, Anhui, Huangshan Mountain District, 29.43 N, 118.18 E, alt. 780 m, 10-V-2014. Coll. Ru CAI. **Paratypes.** 25♀16♂, 41 pupae and 12 larvae, same data as holotype.

Habitat. Pupae and larvae were collected on trailing grasses in a small shaded stream 1–3 m wide running, water temperature was 17°C.

Remarks. This new species is assigned to the *griseifrons*-group of the subgenus *Simulium* by the shape of the genitalia of both sexes, and the 6-filamented pupal gill. This new species most closely resembles *Simulium (S.) grossifilum* Takaoka & Davies (1995) from West Malaysia and *Simulium (S.) hengshanense* Bi & Chen (2004) from China. However, it is clearly differentiated from them by the scutum having 5 longitudinal black vittae on the female scutum, the mamma shape of anterior gonapophyses and cocoon with three small windows, antero-lateral window on either side, the basal arms of ventral plate, slanting and extending with spines hooked on distal end.

Etymology. The species epithet is named after the type locality, Huangshan Mountain District, and used as noun in apposition.

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